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THE

PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

MENTAL TESTS[1]

BY FRANK N. FREEMAN

University of Chicago

The Army Tests

The widespread experimentation with the army tests, particularly Scale Alpha, and their influence on the development of other tests, makes it appropriate to give them the place of emphasis in this year's review. These tests, the publicity which has been given them and the large number of men who gained experience in giving tests by using them as psychological examiners in the army, are doing very much to popularize intelligence tests, and to make familiar the outstanding facts concerning human abilities which tests reveal. Much of the experimentation, to be sure, is the merely routine repetition of what others have done, but occasionally there is an investigator who attacks the problems from a slightly new angle.

Of considerable interest and value to those who are interested in the army tests is the publication of the virtually official manual under the authorship of Yoakum and Yerkes (48). The book contains a reproduction and description of the different scales which were in use in the psychological service, including the group tests, Alpha and Beta, and the individual tests, both language and performance. In addition are given directions for giving and scoring, scoring keys, the scheme for rating and for interpreting

[1] On account of the closing of one library and the moving of another at the time this review was being prepared some of the articles were not available. Those of especial importance will be included in the next article.

the rating on each scale in terms of the others. Besides this account of the tests themselves is a sketchy statement of the methods of designing the tests and a brief account of typical results. This account is evidently a popularized anticipation of the fuller and more technical report which is to follow. For the technical reader the present presentation will raise more questions than it will answer.

During the period covered by this survey there is record of the application of army test Alpha, the general group scale, to students in nine higher institutions and three high schools. The institutions and the authors of the studies follow: Dickinson College, M. G. Filler (6); Hamline University, G. D. Walcott (43); Southern Methodist University, H. T. Hunter (10); Purdue University, G. L. Roberts and G. C. Brandenburg (36); Oberlin College, E. S. Jones (11); University of Minnesota, M. J. Van Wagenen (42); Ohio State University, E. L. Noble and G. F. Arps (25); University of Oklahoma, A. M. Jordan (12); the high schools of Madison, Rock Island and Sioux City, I. N. Madsen and R. H. Sylvester (19, 20 and 21). From these studies data of interest can be gathered with reference to such matters as institution medians, class medians, differences between school groups and sex groups within institutions and correlation with marks.

While the comparison between institutions is somewhat vitiated by some uncertainty concerning the class and sex tested and the method of timing, it is apparent that there are rather wide variations. The highest freshman median recorded is that for the students at Yale, 159.5. The score for Oberlin freshmen is 153, and for the Ohio freshmen, 130. Other scores probably include women, for which an allowance must be made, as will appear shortly. The median at Dickinson is 141, at The Southern Methodist University, 127, and at The University of Oklahoma, 119. Making due allowance for the above-mentioned factors it appears that there is a difference in the general ability of typical students in various educational institutions, due either to selection or training. The explanation involves the general problem of the interpretation of test scores, but whether the differences be ascribed to training or capacity they present administrative problems, such as that of accrediting students and accepting degrees.

Almost uniform sex differences are found in favor of the men in the army test scores. That these differences are specialized rather than general appears when the scores in the individual tests

are compared separately. It appears that the superiority of the men, which amounts in total to from four to eleven points, resides almost entirely in their higher scores in tests 2 and 8, the arithmetic and information tests. The information test is clearly better adapted to men than to women. That the same difference appears between the sexes in the grammar school was found by Uhrbrock (41).

College and university students, and as well the high school students who were tested, are a very highly selected group. The poorest pupils in high school get a rating of C, and in some colleges very few, in others none, are rated as low as this. Undoubtedly a part, but certainly not all, of this superiority is due to training.

The practical usefulness of the tests is indicated to some extent by degree to which the scores correlate with school and college marks. The correlation in college varies from .305 to .52, and in high school from .20 to .38. Of the nine first honor men at Yale, out of 373 freshmen, two were below the median in the test. If the tests are to be used for prognosis a very wide margin of error must be allowed for. There is evidence that other tests are better adapted to the differentiation of high-grade ability.

In view of the usually moderate attainment of members of fraternities as measured by marks, it is interesting that at Dickinson fraternity men made 11.8 points more in the tests than others, and fraternity women 8.7 more. Different schools at Purdue varied from 124.1 (pharmacy) to 137.7 points (chemical engineering) median score, and at Ohio from 112 (veterinary) to 157 (graduate. A comparison of private school and high school alumni at Yale brought out no significant difference. The medians of successive classes indicate a steady and marked progression up to the freshman year of the college, and a less marked progression throughout the college. How much of this is due to elimination of the poor students and how much to maturity the evidence does not show.

Doll (4 and 5) argues from the reported results of the army tests that mental growth in the "average" individual ceases at 13 years, and bases his conclusion on the fact that the average "mental age" of recruits was found to be 13.5 years. He further proposes that 13 be used instead of 16 as the age to correspond to adult mentality in reckoning the IQ of adults. But the evidence is so strong that mental growth continues even beyond the age of 16 that a contrary result should lead to a search for imperfection in the test. Refuge cannot be taken in a fine-drawn distinction be-

tween pure growth and the result of experience, because nobody has succeeded in clearly separating the two. One clue is to be sought in the limitation in the difficulty of the test, which fails to give opportunity to the higher grades of ability, or to the type of ability represented in the older individuals.

Technical Problems in Organization and Evaluation

One of the problems which is prominent in the design of the modern point scale is the determination of the method of scoring the individual tests and of combining these scores; and a phase of this problem is the weighting of the individual tests. Two elaborate schemes of weighting are presented in the articles by Arthur and Woodrow, and by Herring (2 and 9). The tests used in the first-mentioned study are mostly familiar,—memory span, opposites, substitution, word-building, language completion, cancellation and comprehension (Kuhlmann's). They were given to children from six to thirteen years of age. The point value of each tests was calculated on the basis of its discriminative value, that is, the extent to which the scores from it were differentiated in successive years. The formula used was

$$\text{D.V.} = \frac{\text{Av.}_1 - \text{Av.}_2}{\frac{1}{2}(\sigma_1 + \sigma_2)},$$

in which Av. 1 and Av. 2 represent the average scores in two successive ages. The values obtained are used as point scale values, and the value of the score of a given age is found by adding the values up to that point. The value for each age of the entire scale is found by adding those for the individual tests. This, the authors hold, constitutes an absolute scale of mental growth; but it should be noted that the form of the growth curve still depends on the adaptation of the tests to the ability of the pupils at successive ages. Herring used successive grades instead of ages and found the differences in the median performance of successive grades in terms of the P.E. of the distribution in each of his 33 tests. Unlike Arthur and Woodrow, Herring relates his scale values to zero.

The technique of the interpretation of the scores in tests is discussed in three articles. Kelley (13) points out the important fact that the amount of overlapping in the scores of successive ages or grades represents the true overlapping in ability only when the test is perfectly reliable, and that the unreliability of tests has

resulted in gross overestimation of the true amount of overlapping. Thorndike (**38**) names and calls attention to a factor, which those who have dealt with estimates of ability must have noticed, through which the correlation between the estimates of various traits by the same judges is unduly raised. This factor, which Thorndike names appropriately the "error of the halo," is the effect on the judges estimate of an individual's capacity in a particular trait of his general opinion of the individual's ability. This factor undoubtedly has a large influence on school marks. Thorndike suggests its avoidance by having one person produce the data and another judge each trait independently on the basis of the data. Myers (**23**) points out what he calls a fallacy in correlation of test scores, which rests on the fact that if all unselected individuals—presumably by ages—are put into a group for the calculation of correlation, the coefficient will be higher than if the more homogeneous group within a given school grade are used—presumably again by ages. This by no means makes the first practice a fallacy. In fact, it is more useful for the administrator to know what the facts are, independent of the artificial grade grouping.

A series of brief studies on a number of tests, particularly to discover means of making them non-coachable, is reported by F. L. Wells and C. M. Kelley (**47**). The differential reaction of persons over fifty years of age to the tests of the Yerkes Point Scale is reported by Foster and Taylor (**7**). They find marked peculiarities in their scores in naming words, combining three words in a sentence, drawing from memory and rearranging dissected sentences, and give norms with these omitted.

Miscellaneous Correlations

The possibility of finding specific tests in ability in aviation and of predicting success or failure in extreme cases is shown by Henmon (**8**). The composite series or team of tests selected as a result of the correlation study of each one gives a correlation with judgments of flying ability of .70. Parsons and Segar (**26**) found no correlation between the Bárány chair test and flying ability.

Practically identical results with the Pearson and the army rating scales used by instructors in rating college students is reported by Kitson (**14**). This suggests the need of investigating the error of the halo in the use of rating scales.

Several studies, in addition to those with the army tests, have

been made between tests and other measures of ability. Caldwell (3) reports a correlation of .44 between the adult Stanford tests and college marks in the case of students at the Randolph-Macon Woman's College, and .47 with estimated intelligence. Sunne (37) gave the Yerkes and Stanford adult tests to high school and college students and obtained correlations ranging fron .43 to .74 in the point scale, and from .30 to .65 in the Stanford tests. The correlation between reading ability as measured by the Monroe Silent Reading test and general ability as measured by Alpha, is reported by Webb (46), also the correlation of Alpha and Thurstone's tests A and B tests with marks. The coefficients are, Alpha with comprehension .68, Alpha with marks .57, Thurstone A with marks .41, Thurstone B with marks. 49. Ratings of college students by Scott's Rating Scale and college marks were found by Kohs and Irle (15) to have such low predictive value for promotion in the army as to be of no practical value.

Differences between Racial and Environmental Groups

Important differences between racial, occupational and regional groups are reported to have been found in the results of the army tests, but the complete returns have not yet been published. In the meantime less extensive comparisons are being made from time to time. Pressey and Teter report a comparison of 187 colored children with white children in Indiana by the Pressey group scale (34). In conformity with other studies they find the colored children about two years behind. Their inferiority is less in the simpler rote memory tests than in those which require thinking, and they are poorer in the later tests of the scale, which suggests fatigue. A similar difference was found by Partlow and Haines (27) in Alabama. A comparison of Chinese with American students made by Walcott (44) by means of the Stanford revision gave rather inconclusive results.

A comparison of children in a good and a poor country district in Indiana is made by S. L. Pressey and Thomas (35), and a comparison of country and city children and of four occupational groups in the city by L. W. Pressey (29). Another comparison of occupational groups is reported by S. L. Pressey and Ralston (32). In both studies in which country children were compared with city children the former were found to be markedly behind. Only from 20 per cent to 36 per cent exceeded the median of the city group. A considerable portion of this inferiority in the tests is

ascribed to incidental causes, but that some of it represents inherent difference in ability is strongly suggested by the fact that 16 per cent more of the children in the good country district exceeded the median of the city children than of the poor district. Within the city the occupations were grouped under the heads, professional, executive, artisan and laborer. The children stood in this order in the average scores of the groups, and in each case the average of the professional group was a little over double that of the laboring group. There was, of course, considerable overlapping.

Delinquents and dependents in four industrial schools in Alabama were found by Partlow and Haines (**27**) to very inferior in a test patterned after the army test. Of the white boys and girls nearly half are below the five percentile score of normal children. The colored boy delinquents, however, differed much less from a random sampling of colored children. The group tests place in the lowest two percentile nearly all of those who are diagnosed by individual tests to be feeble-minded.

New Tests or New Forms of Old Tests

New group tests are appearing very rapidly. In addition to those which are described in the literature and which are referred to in the list of references below a few others which have come to the attention of the writer may be named. Space does not permit further description.

Author or Name	Grades	Type	Publisher or Distributor
Chicago Intelligence Test	7 to 12	Verbal	Univ. of Chicago bookstore
Dearborn, W. F.		Non-verbal	Lippincott
Haggerty, M. E.			
Delta 1	1 to 4	Non-verbal	World Book Co.
Delta 2	4 to 9	Verbal	World Book Co.
Kingsbury, F. A.	1 to 4	Non-verbal	Univ. of Ill. Bureau of Educ. Research
Illinois Examination	3 to 5	Verbal	Univ. of Ill. Bureau of Educ. Research
	6 to 8	Verbal	
National Intelligence Test Scales A and B	3 to 9	Chiefly verbal	World Book Co.
Omaha Group Test	5 to 8 (?)	Verbal	P. R. Stevenson, Univ. of Illinois
Terman Group	7 to 12	Verbal	World Book Co.
Trabue, M. E. and Stockbridge, F. P.	?	Mixed	Doubleday, Page & Co.
Whipple, G. M.	5 to 8	Chiefly verbal	Public School Pub. Co.

Besides those listed above a number of group tests have recently appeared, and are reported in articles. A group scale for primary

grades consisting chiefly in the adaptation of certain of the tests of the Binet Scale is described by Miss Lowell (17) and 18). Five tests each are places at ages five to nine. Scoring is on the age level principle. A group, non-verbal point scale of four tests for primary grades is described by C. and G. Myers (24). Pintner (28) is the author of a non-verbal group scale of six tests which gives a reasonably normal curve of distribution for children of the upper grades. A brief scale of crossout tests, that is, tests which can be passed by crossing out one element, has been devised by the Presseys (31). One of these is a test for moral judgments, and further suggestions are made for moral tests. These suggestions are elaborated in an interesting manner in the article by Pressey and Chambers (30). This is perhaps the most novel contribution to the field of tests during the year. The five tests are designed to measure, (1) emotional spread and displacement, (2) emotional distractibility, (3) moral discrimination and experience, (4) free association (with, however, limited choice), and (5) emotional memory.

Three adaptations of the Binet Scale are described by Pressey and Shively (33), who substitute terms involving practical information for these in the vocabulary test, by Lincoln and Cowdery (16), and by Washburne (45), who seeks to seeks to make an analytical diagnosis by classifying the tests according to mental function.

Three groups of tests having the purpose of vocational diagnosis are reported by Thurstone (39) and 40) and Murray (22). Thurstone's are general tests adapted in content to the experience and and interests of the groups to whom they are given. Miss Murray attempted to distinguish four general types of ability among college students,—intelligence, accuracy, practical ability and social ability, but was not able to find convincing objective verification of her hypothesis.

References

1. Anderson, J. E. Intelligence Tests of Yale Freshmen. *School & Soc.*, 1920, 11, 417–420.
2. Arthur, G. & Woodrow, H. An Absolute Intelligence Scale: a Study in Method. *J. of Appl. Psychol.*, 1919, 3, 118–137.
3. Caldwell, H. H. Adult Tests of the Stanford Revision applied to College Students. *J. of Educ. Psychol.*, 1919, 10, 477–488.
4. Doll, E. A. The Average Mental Age of Adults. *J. of Appl. Psychol.*, 1919, 3, 317–328.
5. Doll, E. A. The Growth of Intelligence. *J. of Educ. Psychol.*, 1919, 10, 524–525.
6. Filler, M. G. A Psychological Test. *School & Soc.*, 1919, 10, 208–209.

7. Foster, J. C., & Taylor, G. A. The Applicability of Mental Tests to Persons over Fifty Years of Age. *J. of Appl. Psychol.*, 1920, **4**, 39–58.
8. Henmon, V. A. C. Air Service Tests of Aptitude for Flying. *J. of Appl. Psychol.* 1919, **3**, 103–109.
9. Herring, J. P. The Derivation of a Scale to Measure Ability in Scientific Thinking. *J. of Educ. Psychol.*, 1919, **10**, 417–432.
10. Hunter, H. T. Intelligence Tests at Southern Methodist University. *School & Soc.*, 1919, **10**, 437–440.
11. Jones, E. S. The Army Tests and Oberlin College Freshmen. *School & Soc.*, 1920, **11**, 389–390.
12. Jordan, A. M. Some Results and Correlations of Army Alpha Tests. *School Soc.*, 1920, **11**, 354–358.
13. Kelley, T. L. The Measure of Overlapping. *J. of Educ. Psychol.*, 1919, **10**, 458–461.
14. Kitson, H. D. Comparison between Two Scales for the Estimation of Intelligence. *J. of Appl. Psychol.*, 1919, **3**, 310–316.
15. Kohs, S. C. & Irle, K. W. Prophesying Army Promotion. *J. of Appl. Psychol.*, 1920, **4**, 73–87.
16. Linclon, E. A. & Cowdery, K. M. An Abbreviated Mental Age Scale for Adults. *School & Soc.*, 1919, **10**, 707–709.
17. Lowell, F. A Preliminary Report of Some Tests of General Intelligence. *J. of Educ. Psychol.*, 1919, **10**, 323–344.
18. Lowell, F. A Group Intelligence Scale for Primary Grades. *J. of Appl. Psychol.*, 1919, **3**, 215–247.
19. Madsen, I. N. & Sylvester, R. H. High-school Students' Intelligence Ratings according to the Army Alpha Test. *School & Soc.*, 1919, **10**, 407–410.
20. Madsen, I. N. High-school Students' Intelligence Ratings according to the Army Alpha Test. *School & Soc.*, 1920, **11**, 298–300.
21. Madsen, I. N. The Army Intelligence Test as a Means of Prognosis in High School. *School & Soc.*, 1920, **11**, 625–628.
22. Murray, E. Psychological Tests as Diagnosis of Vocational Aptitudes in College Women. *J. of Appl. Psychol.*, 1920, **4**, 30–38.
23. Myers, G. C. A Grave Fallacy in Intelligence Test Correlations. *School & Soc.*, 1920, **11**, 528–529.
24. Myers, C. & Myers, G. A Group Intelligence Test. *School & Soc.*, 1919, **10**, 355–360.
25. Noble, E. L. & Arps, G. F. University Students' Intelligence Ratings according to Army Alpha Test. *School & Soc.*, 1920, **11**, 233–237.
26. Parsons, R. P. & Segar, L. H. Bárány Chair Tests and Flying Ability. *J. Amer. Med. Ass.*, 1919, **70**, 1064–1065.
27. Partlow, W. D., & Haines, T. H. Mental Rating of Juvenal Dependents and Delinquents in Alabama. *J. of App. Psychol.*, 1919, **3**, 291–309.
28. Pinter, R. A Non-language Group Intelligence Test. *J. of Appl. Psychol.*, 1919, **3**, 199–214.
29. Pressey, L. W. The Influence of (*a*) Inadequate Schooling and (*b*) Poor Environment upon Results with Tests of Intelligence. *J. of Appl. Psychol.*, 1920, **4**, 91–96.
30. Pressey, S. L. & Chambers, C. R. A Group Scale for the Emotions. *J. of Appl. Psychol.*, 1920, **4**, 97–104.

31. PRESSEY, S. L. & PRESSEY, L. W. Cross-out Tests, with Suggestions as to a Group Scale of the Emotions. *J. of Appl. Psychol.*, 1919, 3, 138–150.
32. PRESSEY, S. L. & RALSTON, R. The Relation of General Intelligence of School Children to the Occupation of their Fathers. *J. of Appl. Psychol.*, 1919, 3, 366–373.
33. PRESSEY, S. & SHIVELY, I. M. A Practical Information Test for Use with Delinquents and Illiterate Adults. *J. of Appl. Psychol.*, 1919, 3, 374–380.
34. PRESSEY, S. I. & TETER, G. F. A Comparison of Colored and White Children by Means of a Group Scale of Intelligence. *J. of Appl. Psychol.*, 1919, 3, 277–282.
35. PRESSEY, S. L. & THOMAS, J. B. A Study of Country Children in (1) a Good and (2) a Poor Farming District by Means of a Group Scale of Intelligence. *J. of Appl. Psychol.*, 1919, 3, 283–296.
36. ROBERTS, G. L. & BRANDENBURG, G. C. The Army Intelligence Tests at Purdue University. *School & Soc.*, 1919, 10, 776–778.
37. SUNNE, D. The Relation of Scholarships to the Yerkes and Terman Adult Tests. *J. of Educ. Psydchol.*, 1919, 10, 520–524.
38. THORNDIKE, E. L. A Constant Error in Psychological Ratings. J. *of Appl. Psychol.*, 1920, 4, 25–29.
39. THURSTONE, L. L. A Standardized Test for Office Clerks. *J. of Appl. Psychol.*, 1919, 3, 248–251.
40. THURSTONE, L. L. Mental Tests for Prospective Telegraphers, etc. *J. of Appl. Psychol.*, 1919, 3, 110–117.
41. UHRBOCK, R. S. Sex Differences as Noted in Grammar-school children. *School & Soc.*, 1920, 11, 507–509.
42. VAN WAGENEN, M. J. Some Results and Inferences derived from the Use of the Army Tests at the University of Minnesota. *J. of Appl. Psychol.*, 1920, 4, 59–72.
43. WALCOTT, G. D. Mental Testing at Hamline University. *School & Soc.*, 1919, 10, 57–60.
44. WALCOTT, G. D. The Intelligence of Chinese Students. *School & Soc.*, 1920, 11, 474–480.
45. WASHBURNE, C. W. A Classified Scale for Measuring Intelligence. *J. of Educ. Psychol.*, 1919, 10, 309–322.
46. WEBB, L. W. Ability in Mental Tests in Relation to Reading Ability. *School & Soc.*, 1920, 11, 567–570.
47. WELLS, F. L. & KELLEY, C. M. Briefer Studies from the Psychological Laboratory of McLean Hospital. *J. of Appl. Psychol.*, 1919, 3, 172–193.
48. YOAKUM, C. S. & YERKES, R. M. *Army mental tests.* New York: Henry Holt & Co., 1920. Pp. 303.

CHILD PSYCHOLOGY

BY DAVID MITCHELL

New York City

General Discussions.—Were You Ever a Child by Dell (**10**) attempts to show a child's attitude toward the situations in which he is placed. The chief point of consideration is the school. He reports that the present system fails to meet requirements and insists on revolutionary changes. Modern education, to meet the demands of present civilization, must be revised. To progressive teachers the notion that the stimuli which are presented to a child must not be foreign to the situations which he will inevitably meet, is somewhat unnecessary. The book is a stimulating discussion of the problem and many people may find it helpful in clarifying their thinking on how children should be treated.

Evans (**12**) in *The Problem of The Nervous Child* has a psychoanalytic background. One is somewhat impressed with the rather meager psychological knowledge which the author displays, and can hardly avoid thinking that a general philosophy has been developed on a weak foundation. It is not necessary to deny that all children are free from sex complexes. It seems just as unnecessary to affirm that all neurotic conditions among children have their origin in such complexes. The subject is one on which a great deal more information is necessary, but such information will be secured on the basis of experimental studies and actual contact with children.

From one of the early students of children in this country we have a discussion of the historical child. Chrisman (**7**) in *Paidology; The Science of The Child*, brings together a great deal of information. He deals with child life in many different countries and times. He thus presents some valuable information and gives students of the subject a better idea of childhood experiences in times other than our own. The title of his book goes back to his early study when he first used the term "paidology" as the name for this scientific investigation.

The title of Dunn's (**11**) book, *The Natural History of the Child, A Book for All Sorts and Conditions of Men, Women and Children*,

gives one a faint idea of what to expect in the discussion. There is plenty of interesting information in this introduction to child study but unfortunatelv it is not well organized and the reader must search long to get any unified picture of the author's notion of a child's mental condition, his behavior, his play or his attitudes.

According to Meriam (**26**) in *Child Life and the Curriculum*, the situations which we arrange for the modern child are thought desirable simply because of tradition. They do not consider present demands or opportunities. When presenting this indictment of educational procedure, the author also shows what has been done in an experimental school conducted in the middle west. In that school the procedure is outlined to meet what are now considered to be the pressing needs of the child.

Woodrow (**44**) when he discusses *Brightness and Dullness in Children* has a similar thesis to uphold. The child's interests must be appealed to by the educational procedure. Furthermore, education must cease to consider children as though they were all of the same material with like capacities and abilities. Rather, it must vary the procedure in accordance with an understanding of the individual. In giving information concerning children, the author discusses measurements of intelligence, the question of what is meant by brightness and dullness, pedagogical age and various mental processes.

Kirkpatrick (**21**) divides his book on *Imagination and its Place in Education* into three sections. The first part deals with imagination from a general point of view. The third is concerned with the relation of imagination to school subjects. It is in the second part that the imaginative life of children is considered. For his discussion he has an excellent basis of fact in the imaginative products of children. This important capacity of each child should be developed. It has significance from the pedagogical point of view, and he shows its application in school studies.

In *The Child Under Eight* by Murray and Smith (**28**) there is an attempt to show the development of the child in these early years. The first part of the book deals with early infancy and attempts to show how the child develops from his original innocence or ignorance to a realization of fact. In the second part, the child has grown away from his world of fantasy and has come into a world of "things as they are." He thus begins to deal with vital principles. While there are some interesting suggestions, this discussion of a child's life seems to be faulty from the standpoint

of what is known of child psychology. The child's attitude is undoubtedly changing to a marked degree. Relatively, there is probably more adaptation made in those first eight years than there is in any other similar length of time. It hardly seems justifiable, however, to say that the child of two or three does not have fairly clear ideas of things as they are. He is responding to stimuli according to the nature of his nervous mechanism and the experience which he has had up to date. From the writer's observation of a considerable number of children, he feels constrained to say that there are as wide variations in the adaptation of a child of this age as there are at later periods. It may be that in the introduction to school life the child is dealing with something altogether extraneous to his natural inclinations and desires. This is, however, not a question of child development but rather a consideration of the unnecessary conditions which we arbitrarily impose upon the developing child.

Cather (**6**) has recognized the fact that stories stimulate the imagination, and in *Taking up Story-Telling* she says that in the dependence upon books the story is likely to be overlooked. Its importance is minimized and other forms of instruction are used when the story might be more effective. The author states that there are four periods of story interests. She also presents a number of stories which could be used. Any person who wishes to adopt this method of stimulating a child's imagination and developing him in other ways, will find much helpful material in this book.

Intelligence and Exceptional Children.—Intelligence of School Children by Terman (**36**) discusses the principles of intelligence testing. The aim is to show the great differences in original endowment. A valuable part of the report for the child psychologist is that of the individual differences among kindergarten and first grade children. The author shows that throughout the various grades there is a great overlapping. In most cases it is not a question of training or environment which accounts for this fact. It is a question of original endowment. Separate studies are presented of a number of superior children. These discussions help us to understand that child who in some ways is more retarded than those children who are several years behind their age-grade.

Sylvester (**35**) reports *An Intelligence Survey of a Typical Town School.* He examined 267 children and found that according to the tests, the distribution in intelligence was approximately that of the so-called normal curve. Slightly more than half the number

were classed as average, 15 were rated as having very superior intelligence and 11 as inferior. More than one third of the children were mentally peculiar in some way.

Pressey (31) has attempted to fill a long felt want. *The Group Scale of Intelligence for Use in the First Three Grades* has been needed for classification purposes. Instead of classifying children according to the day they enter school, or alphabetically, the aim is to group them so that too wide differences in native capacity will not be found in any one school group. In formulating the series of tests the author had to avoid five difficulties,—inability to read and write, fatigue, inability to understand formal terms, inability to change readily from one type of problem to another, refusal to work unless completely understanding the directions. These difficulties have been fairly well overcome in the series of tests suggested, but the author admitting that this is the first scale of intelligence for such young children says that it is pioneer work. The tables of norms and distributions which he has presented are, therefore, tentative. The evidence, however, leads one to believe in the validity of the scale.

Teter and Pressey (37) made *A Comparison of Colored and White Children by Means of a Group Scale of Intelligence.* He had three questions to answer. First, grade for grade, how do colored children compare with white; second, age for age, how do the two groups compare; third, do the colored children show a distinctive make-up of mental abilities? The tests included rote and logical memory, practical judgment, arithmetical and literary problems. In every way, the colored children are inferior to the white. Various hypothetical reasons are presented for the difference. The colored children are not examined by people of their own race. They come from a social and psychological environment different from that which molds the mentalities of white children. There is a race consciousness in the part of the country where the experiment was made. There was no adaptation to the particular needs of the colored group. These hypothetical explanations, however, are partially rejected because the difference in results is so marked. It seemed impossible that these causes could be adequate.

In *A Study of Country Children in (a) A Good and (b) A Poor Farming District*, this same author with Thomas (38) finds that country children make a poorer showing than city children. Various reasons for this condition may be suggested. The test situation

is somewhat less familiar to the country children. The latter are also shy with strangers, being awkward and embarrassed. The tests required the use of pencils and country children were not so much accustomed to that use. In an unselected group of country children the mental rating is about one year below that of city children. There is, however, no particular thing that is distinctive. In the same way, the children of a good farming district average above children in a poor district. The authors also suggest that these particular types of intelligence tests do not give adequate measures of the ability of country children. Performance tests and others more appropriate to the environment of the country children might show a different result.

The Relation of the General Intelligence of School Children to the Occupation of Their Fathers is a subject studied by Ralston and Pressey (**32**). The object of the investigation was to obtain a measure of differences in children coming from different kinds of homes and to examine the amount of overlapping between groups. Fourteen thousand cases were studied and it is reported that there are 548 cases where the parent's occupation was known. There were four groups of occupations—the professional, the executive, the artisan and the laborer. Percentages of children in each occupation group who make scores in the highest and lowest 10 per cent for their age are given. In all cases, the children of the professional group are superior.

Some Adaptive Difficulties Found in School Children by Richards (**33**) is a sequel to reports given on the Locust Point District in Baltimore. It is a rather extensive study of a considerable number of individual children. It gives information concerning the school history, the type and beginning of difficulties, and suggests modifications in the method of treatment. The recommendations are based on a study of biological, psychological, psychopathological, and sociological factors. The plans suggested for the modification of treatment add considerable value to the whole discussion.

Patri (**30**) in *The Gifted Child* gives a well-written story in popular style in which he outlines the attitude of these children and points the way to a fuller understanding of them. *The Training of Very Bright Children* by Witmer (**43**) is a plea for greater attention to the exceptionally competent child. According to the author special education should begin about four years of age and by means of a clinic teacher who would supplement either the kindergartener or the first grade teacher. The point of attack would be

the ability and characteristics of the child. The author insists that it is possible to determine with great precision before a child is six years of age what is his competency for the work of the first grade under prescribed conditions.

Ide (16) discusses *The Educability of Five-Year-Old Children.* The subjects of the investigation were children of the best residential district. A significant part of the report is the presentation of individual case studies.

Speech and Vocabularies.—Magni (24) in *Vocabularies* gives a synopsis of previous studies and outlines the different methods for acquiring a vocabulary. He says that at four or five years of age the process of language formation is about finished. The foundation for the development of a vocabulary has been laid. According to the author "in about four or five years the most important and decisive stage in psychic unfoldment has been completed." Tompkins (39) in *The Stammering Problem Solved* gives expression to his views on the right method of training for defective speech. It would be of great value to teachers if it could be definitely shown that any one theory is satisfactory or any one method of procedure produced the desired results. In *Stammering As a Disorder of Speech Dependent on Conditions of Child Development,* Kenyon (20) discusses the development of stammering and its psychological implications. According to him, this defective speech is a perversion of normal processes dependent on emotional disturbances. The immediate psychology involves (1) emotional excitement, (2) mental confusion and (3) the impulsive effort to talk while in this confused state of mind. "The result is a speech panic in which normal control of the peripheral speech machine is for the moment lost."

Special Topics.—Burt (4) discusses the development of reasoning in school children. According to him the mental mechanism necessary for formal reasoning is developed by the time the child reaches the mental age of seven. This has an important bearing on educational procedure and it will be wise to have considerable experimental investigation in order to determine just what the educational methods should be.

White (41) takes up *Expression in Childhood.* Far more encouragement should be given to this phase of a child's development. As it now stands, natural and sincere expression is not found easy by the majority of young people when they leave school. This handicap is a more or less lasting hindrance to the

fullest and most complete life. According to the author the school experience tends to inhibit spontaneity and curb freedom. The natural expressiveness of childhood is crushed by an adverse environment or unsympathetic treatment.

Malzberg (25) discusses the mind of the child from the Freudian standpoint. Considering the contribution of Freud, he says "it is not too much to compare the intellectual stimulus resulting from his study and writings with that brought about by Charles Darwin in the field of biology." The chief point of this article is a review of three books written by Lay, White and von Hug-Hellmuth on the mental life of the children. Each of these has the Freudian philosophy as a background.

According to Jewell (18) "ideals transfer all through life, once we can produce them." It is, therefore, necessary to turn out from our school rooms children with high ideals, worthy purposes and true standards of conduct. We need not then be greatly concerned with the acquisition of useful knowledge or its good application.

According to Sidis (34) a child is usually regarded as a sort of little beast, or at best a little savage. He is trained to act not by the light of reason but according to the command of superior force. He is ruled by fear and trained into discipline and obedience through this emotional factor. In the early education of children they should be immunized against "mental microbes," against superstitions and prejudices. We should encourage the cultivation of critical judgment and work against the formation of harmful beliefs. This is an excellent discussion on the necessity of avoiding a harmful method of instruction.

White (42) comments, "all approaches to the understanding of defective psychological adjustments point indubitably to childhood as the period when things first go wrong, and the indication is therefore clear that this is the period which must be studied and modified to prevent the failure of later life." An individual adjustment is conditioned by two factors: (1) the nature of a problem and (2) the character equipment. White recognizes the importance of the causal relationship between present conditions and past experiences. We must not consider the child as a little adult, but there must be a real understanding and development of child psychology together with an understanding of the relation to his environment. The author suggests that in an investigation of a child we should not limit ourselves to the Binet test. Fortunately, child psychologists have insisted on this point for many years.

Campbell (5) discusses the effect on character of the experiences of a child. He comes out strongly for the statement that the problem of mental adjustment inevitably goes back to childhood. He presents several interesting cases where character was modified by specific experiences and shows where re-education was possible by changing the method of treatment. To the reviewer, the discussion of the topic is somewhat marred by the almost invariable reference to the sex attitude between parent and child. The author has presented some extremely significant points which have no reference to this attitude and which seem to be much more important than it.

The influence of success and failure in mental health is discussed by Burnham (3). "It is a great aid in the life of a boy or girl when the first conscious effort for a definite thing is distinctly made." The influence of this effort and the notion that definite success in a certain line of work is possible, in some cases never dies out. The stimulus of that experience has made one work as never before. According to the author, "The teacher's business is to see to it that every child at some time, in some way, in some subject, achieves a marked success, and that sometimes they get an honest gauge of themselves by failure."

Abbott (1) outlines a *Program for Mental Hygiene in the Public Schools*. His aim is to meet the needs of the normal child, showing also in what way the needs of the teacher affect the situation. He presents two programs of action, one he calls the Ideal and the other the Practical. The Ideal is certainly much to be desired. His discussion of it is most appropriate and his attempt to define the functions of the various assistants in a Mental Hygiene Bureau will help to clarify our ideas.

In a *Parent's Study of Children's Lies*, Leonard (22) states that the "evidence of deceit in a child precedes speech." The author understands the child fairly well and says that his exaggerations are due in large measure to faulty judgment. He discusses the reasons and methods for training and insists that parents should ask as few incriminating questions as possible. They should be worded so as not to suggest an untruth to the child. The chief cause of lying or deceit is fear, and much of the responsibility for it lies in the parent's attitude.

Averill (2) in *The War and the Psychology of the Child* says that children had an interest in it. He reports five observations of free native responses made by them. The younger children make

a noise and have a hazy idea of military activities. The older children, those between 7 and 10 years, imagine and act scenes of war according to definite ideas.

Gray (14) reports some of the mental effects of the motion pictures on children. This is an important field of study and one which probably holds ideas of great value for the educator.

Watson (40) writing for teachers of kindergarten and primary grades, discusses the emotional life of children. To a considerable extent he refers to the material which he had reported in other writings.

Loeb (23) gives the results of an experiment in which she wished to ascertain what young children would do when they were given as few suggestions by the teacher as possible and where their activities had little interference. She shows some of the materials which children choose voluntarily and the games they play when left to themselves.

Ioteyko (17) discusses types of memory in children and shows the relation which they have to methods of education.

Court (9) discusses the development of the notions of number, time and space in the first five years. Below the school age children are interested in counting but their interest is modified by seasonal influences, individual preferences and immediate applications. One child's conception of number began at 20 months. A child three and a half years of age made accurate use of "morning" and "afternoon." Another child at two years and ten months "consciously measured space." Noon (29) in *The Child's Use of Numbers* gives a list covering three pages of the ways in which children use numbers. During the period of the elementary school grades the children make little use of arithmetic outside of school. According to the author, below the seventh grade "no needs are felt by the child which require the teaching of arithmetic in school." The reading of numbers and counting meet all the requirements.

The influence of physical condition on mental ability is discussed by Mitchell and Forbes (27). The ability of a well-nourished group of children is measured by a group of tests and comparison is made with that of the under-nourished. No superiority of one group over the other is definitely established. This result is similar to those from many other experiments, in which the relation of different factors to mental ability was considered.

Hollingworth (15) discusses *Special Disabilities That Contribute to Retardation in School Children.* There are several interesting

cases presented of special disabilities in apparently normal children.

Johnson (19) makes use of a modified Woodworth questionnaire to study the emotional characteristics of children. There are 60 questions in the list and they were given individually to 75 boys from 10 to 15 years of age.

Conklin (8) discusses *The Foster-Child Fantasy*. He reports that the psychoanalysts have the idea that all or most children experience this fantasy. It is thought that it exerts a considerable influence upon the child's conduct. By the questionnaire method this author investigates the problem. His subjects were students in the two upper classes of high schools. He had 920 returns and judges 904 of them as being sincere. He concludes from his results that the foster-child fantasy has been demonstrated to be a common experience of childhood. His discussion includes the causes for the fantasy, ages at which it developed and the variety of attitudes from partial belief to none at all. The common age for the appearance of the fantasy is around twelve years. The effect of the fantasy was "conduct alienating the children from parental authority."

Frasier (13) considers variability in the capacity of boys and girls. After outlining the opinion of two opposed schools and presenting historical evidence both for and against a belief in a sex difference, he reports a study which included over 62,000 thirteen year old boys and girls. On the basis of his results the author suggests that there is little difference as far as mental ability is concerned.

References

1. Abbott, E. S. Program for Mental Hygiene in the Public Schools. *Ment. Hyg.*, 1920, 4, 320–330.
2. Averill, L. A. The War and the Psychology of the Child. *Ped. Sem.*, 1919, 26, 356–364.
3. Burnham, W. H. Success and Failure as Conditions of Mental Health. *Ment. Hyg.*, 1919, 3, 387–397.
4. Burt, C. The Development of Reasoning in School Children. *J. of Exper.* Ped., 1919, 5, 121–127.
5. Campbell, C. M. The Experiences of the Child, How They Affect Character. *Ment. Hyg.*, 1920, 4, 312–319.
6. Cather, K. D. *Taking up Story-telling*. Yonkers-on-Hudson: World Book, 1918. Pp. 316.
7. Chrisman, O. *Paidology; the Science of the Child. The Historical Child*. Boston: Badger, 1920. Pp. 471.
8. Conklin, E. The Foster-Child Fantasy. *Amer. J. of Psychol.*, 1920, 31, 59–76.
9. Court, S. R. A. Number, Time and Space in the First Five Years of a Child's Life. *Ped. Sem.*, 1920, 27, 71–89.

10. Dell, F. *Were You Ever a Child?* New York: Knopf, 1919. Pp. vii + 202.
11. Dunn, C. *The Natural History of the Child; A Book for All Sorts and Conditions of Men, Women, and Children.* New York: Lane. Pp. 316.
12. Evans, E. *The Problem of the Nervous Child.* New York: Dodd, Mead, 1920. Pp. vii + 299.
13. Frasier, G. W. A Comparative Study of the Variability of Boys and Girls. *J. of Appl. Psychol.*, 1919, **3**, 151–155.
14. Gray, P. L. Children and the Cinema. *J. of Exper. Psychol.*, 1920, **5**, 194–198.
15. Hollingworth, L. S. Special Disabilities That Contribute to Retardation in School Children. *Ungraded*, 1919, **5**, 49–54.
16. Ide, G. G. The Educability of Five Year Old Children. *Psychol. Clinic*, 1919, **13**, 146–172.
17. Ioteyko, J. Les types de memoire chez l'enfant au point de vue pedagogique. *Educ.*, 1919, **11**, 19–31.
18. Jewell, J. R. The Education of the Feelings. *Sch. and Soc.*, 1920, **11**, 151–153.
19. Johnson, B. Emotional Instability in Children. *Ungraded*, 1919, **5**, 73–79.
20. Kenyon, E. L. Stammering as a Disorder of Speech Dependent on Conditions of Child Development. *Volta Rev.*, 1920, **22**, 39–45.
21. Kirkpatrick, E. A. *Imagination and Its Place in Education.* Boston: Ginn, 1920. Pp. 214.
22. Leonard, E. A. A Parent's Study of Children's Lies. *Ped. Sem.*, 1920, **27**, 105–136.
23. Loeb, J. An Experiment in a Public School Kindergarten. *Kindergarten and First Grade.* 1920, **5**, 52–63.
24. Magmi, J. A. Vocabularies. *Ped. Sem.*, 1919, **26**, 209–233.
25. Malzberg, B. The Child's Mind a la Freud. *Social Hyg.*, 1920, **6**, 105–112.
26. Meriam, J. L. *A Child's Life and the Curriculum.* Yonkers-on-Hudson: World Book, 1920. Pp. xii + 538.
27. Mitchell, D. & Forbes, H. Malnutrition and Health Education. *Ped. Sem.*, 1920, **27**, 36–66.
28. Murray, E. R. & Smith, H. B. *The Child Under Eight.* New York: Longmans, Green, 1919. Pp. 236.
29. Noon, P. G. The Child's Use of Numbers. *J. of Educ. Psychol.*, 1919, **10**, 462–467.
30. Patri, A. The Gifted Child. *Red Cross Mag.*, 1920, **15**, 37–42.
31. Pressey, W. L. The Group Scale of Intelligence for Use in the First Three Grades. *J. of Educ. Psychol.*, 1919, **10**, 297–308.
32. Pressey, S. L. & Ralston, R. The Relation of the General Intelligence of School Children to the Occupation of Their Fathers. *J. of Appl. Psychol.*, 1919, **3**, 366–373.
33. Richards, E. L. Some Adaptive Difficulties Found in School Children. *Ment. Hyg.*, 1920, **4**, 331–363.
34. Sidis, B. A Lecture on the Abuse of the Fear Instinct in Early Education. *J. of Abnor. Psychol.*, 1919, **14**, 333–348.
35. Sylvester, R. H. An Intelligence Survey of a Typical Town School. *Ped. Sem.*, 1920, **26**, 365–371.
36. Terman, L. M. *Intelligence of School Children.* New York: Houghton Mifflin, 1919. Pp. 317.
37. Teter, G. F. & Pressey, S. L. A Comparison of Colored and White Children

by Means of a Group Scale of Intelligence. *J. of Appl. Psychol.*, 1919, **3**, 277–282.

38. Thomas, J. B. & Pressey, S. L. A Study of Country Children in (a) A Good and (b) A Poor Farming District by Means of a Group Scale of Intelligence. *J. of Appl. Psychol.*, 1919, **3**, 283–286.
39. Tompkins, E. The Stammering Problem Solved. *J. of Abnor. Psychol.*, 1919, **14**, 349–352.
40. Watson, J. B. The Pre-Kindergarten Age—a Laboratory Study. *Kindergarten and First Grade.* 1920, **5**, 14–18, 68–72, 105–109.
41. White, E. M. On Expression in Childhood. *The Child.* 1920, **10**, 303–307.
42. White, W. A. Childhood: the Golden Period for Mental Hygiene. *Ment. Hyg.*, 1920, **4**, 257–267.
43. Witmer, L. The Training of Very Bright Children. *Psychol. Clinic*, 1919, **13**, 88–96.
44. Woodrow, H. *Brightness and Dullness in Children.* Philadelphia: Lippincott, 1919. Pp. 332.

EDUCATIONAL PSYCHOLOGY

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The outstanding features of the literature in educational psychology for the past year may be summarized as follows:

(1) No decrease is to be noted in the interest shown in educational tests and measurements. Several new scales and tests have appeared along with articles which attempt careful and detailed interpretations of data collected by means of the earlier tests and scales. Interest in this type of work among those who are concerned with the subject-matter of the various subjects rather than with psychology seems to be increasing. (2) Many articles have appeared which are concerned with intelligence tests as a basis for educational procedure. (3) Clinical methods for diagnosing difficulties in particular school subjects has been discussed briefly. (4) The proper instruction of bright children has received the attention of a few investigators.

Textbooks and Monographs

The first book to be mentioned in this connection is by Strong (83). This text is intended for beginners in the subject and is behavioristic in its approach to all problems. It is divided into three parts. These parts treat of the learning process, of individual differences, and of some of the physiological aspects of psychology. The topics treated under these heads are well selected and are familiar to all teachers of the subject. A criticism which will doubtless occur to some is that too many physiological details are given in the treatment of certain topics in the last part.

The contribution of the book lies in the method of presentation. First, the book is inductive in most of its procedure. This method has received a great deal of emphasis on the part of those who have taught educational psychology, but the same persons have been very slow to introduce this method into their own work. Second, laboratory problems are correlated very closely with the work of the course. Such problems are introduced as a regular part of the work and apparently are to be dealt with during the regular class

hours rather than in a manner which makes them more or less separate and apart from the course, and which makes it somewhat difficult for the student to see the relations which exist between the various parts of the course. These features in the book make it worthy of the careful attention of all those who teach this subject.

A second book treating of educational psychology by La Rue (47), has been been treated in a special review in this number of the BULLETIN. Critics will object to certain expressions which are to be found in the text. Among these are the statements that *mind dwells in the brain* and that *mind is experience.* Further criticisms will evidently be that too much space is given to the psychology of sound and vision for a text of this type.

A book entitled "Brightness and Dullness in Children" by Woodrow (100) will be of interest to all teachers and students of mental measurements. The author begins with concrete examples which show clearly the great differences in intelligence which exist between individuals. These are followed by a brief discussion of methods of measuring intelligence, and a discussion of "Brightness and Dullness." Brightness is defined in terms of the social status, in terms of mental age, and in terms of intelligence quotients. This chapter along with those on the organization of education and educational methods will prove of most interest to teachers. For students of education the book will serve well as an introduction to many of the problems and methods involved in mental measurements.

Probably the most noteworthy special treatise of the past year is one by Seashore (80) entitled "The Psychology of Musical Talent." The book begins with an analysis of musical ability. This discussion shows how such an analysis can be made to serve as a basis for a "talent inventory." A number of such talent charts for different persons are shown and discussed. This analysis is followed by chapters devoted to discussions of the various elements which enter into musical talent. The topics treated are as follows: pitch, intensity, time, rhythm, timbre, consonance, auditory space, motor control, musical action, musical imagery, musical memory, musical intellect, musical feeling and training in the art of music.

The entire work is based upon detailed laboratory experiments. This gives it high rank as a scientific treatise. As a result of his study, the author has devised a series of six tests which are of such a nature that they may be given to school children in groups. These tests for the most part deal with native equipment and

may, therefore, be used for the vocational and avocational guidance of childhood. A report (80a) on their use in the 5th and 6th grades of the Des Moines, Iowa, schools is published as a study from the Iowa Child Welfare Research Station. This work will be of interest to all those who may have to deal with the problems of musical education and surveys of musical talent.

The Nineteenth Yearbook (59), Part II, is devoted to a discussion of education of gifted children. The treatise first considers certain methods for dealing with children of this type. These methods involve flexible promotion schemes and special rooms. These discussions are followed by detailed results from an experiment in teaching gifted children at Urbana. The monograph closes with a series of directions for the selection of gifted children, for the organization of special rooms for such pupils, and for their instruction.

Three monographs in the series issued by Teachers College, Columbia University, are at hand. One of these by Murdock (55) presents a scale for measuring certain elements in sewing. The material upon which this scale is based was obtained from a special exercise given in sewing to 1212 persons of various ages and of distinctly different mental abilities. The methods by which the scale is derived are similar to those employed in all scales in which Professor Thorndike has been interested.

This scale differs from those in other subjects in that it attempts a detailed analysis of sewing. The purpose of this analysis is set forth by the author in the following words: "In the first place, it was hoped that as it stands it [analysis] will be a direct aid in the teaching of sewing. In the second place, this analysis was used . . . as a basis for a study of the number of faults which actually do exist in children's sewing under present conditions." The various elements derived from this analysis are evaluated very carefully by statistical methods. The analytic phase of this scale probably marks a distinct advance in the development of educational measure. Another important phase of the scale is the careful way in which its reliability and validity has been worked out.

A second monograph in this series is by Wilson (96). It is entitled "A Survey of the Social and Business Usage of Arithmetic." The problem is concerned with determining the amount and kinds of arithmetic which is used by adults in their daily experiences. It is the opinion of the author that arithmetic as thus used should serve as a basis for the school curriculum in this subject. His

philosophy of the curriculum is expressed in the following quotation: "While not denying the cultural and disciplinary value of arithmetic . . . , it is assumed that arithmetic in the grades is justified only on the basis of its utility in the common affairs of life."

The data upon which the conclusions are based were collected by asking fathers and mothers of sixth, seventh, and eighth grade children to report different problems which they meet in daily life. In this way 14,583 problems were collected from 4,068 people living in 23 cities and towns. Among this number of persons 155 occupations are represented. The results show that a very large percentage of the problems involve only one of the four fundamental processes and that the problems reported are very simple. On the basis of these results the writer argues that many of the traditional processes in arithmetic should be omitted. In other words his argument is that arithmetic required of children should be reduced to the level set by adult usage.

A third monograph in this series is by O'Brien (**61**) and has to do with failures made by pupils in high school. The causes for such failures are those which are to be found within the schools themselves. The particular type of evidence sought is that contained in school records. In line with this the grades of 6,541 pupils in 12 different high schools are studied.

The following problems are considered from the standpoint mentioned above: (1) How extensive are failures? (2) The prognosis of the number of failures. (3) The relation between graduation and the number of failures. (4) The relation between presistence in school and the number of failures. (5) Means employed for remedying failures. (6) Relation between capability for high school work and failures. (7) What treatment is suggested?

One of the most interesting conclusions of the writer is that pupils who lack native ability sufficient to do high school work are few in numbers. Such a statement sounds a little strange in view of the large amount of emphasis which is being placed at the present time upon intelligence and its relation to education. The monograph deserves the careful consideration of all those who are concerned in any way with the education of the adolescent child.

A monograph by Manuel (**51**) deals with two problems as found in drawing ability. These are: (1) The essential psychophysical characteristics which accompany drawing ability, and (2) The application of the test methods to the diagnosis of such ability. Forty five tests were given nineteen subjects who had been selected

because of their special ability in drawing. The work marks considerable progress in this field and the author promises further contributions along the same lines.

The last monograph (81) to be mentioned is one in which the results of the sixth annual conference on educational measurements at Indiana University are reported. This consists of a series of reports upon the use and derivation of various tests by different speakers. It contains much interesting and valuable material.

Intelligence Tests

As suggested earlier, there is a great deal of interest at the present time in intelligence tests from the standpoint of their use as a basis for educational procedure. By this is meant that their value is seen not only as a means of dealing with the student of low grade mental activity but also as a way of locating children of superior and of average intelligence. Further results from the use of the army tests upon students in college have been reported by Roberts and Brandenburg (76), Noble and Arps (60), Jordon (40), Jones (38), and Anderson (1). The use of the same tests upon high school students has been reported by Madsen (49), and an intelligence survey of a town school has been made by Sylvester (84).

Certain general problems in connection with intelligence testing such as the significance of such work and its methods have been discussed by Dodge (20), Colvin (11), and Myers (57).

Other writers have discussed intelligence tests in their relation to various educational problems. In this connection Authur (2) has dealt with such tests in their relation to retardation. Toops and Pintner (90) have an article entitled, "Mentality and School Progress." The value of such tests for prognosis has been treated by Pressey (67), Proctor (73) and Madsen (50), while Terman (85) has shown the value of intelligence tests in grading children. Proctor (71) and (72) also has articles which deal with such tests in their relation to the vocational and educational guidance of pupils. Further than this Dickson (19) has reported upon the use of tests of this type in the first grade, and Pressey (69) has made a similar report upon the second grade. Psychological tests as a basis for admission of students to college have been discussed by Jones (37) and Thorndike (88). Thorndike (89) has also dealt with the problem of intelligence tests as a substitute for content examinations.

A series of tests which combine intelligence and educational

tests has been devised by Buckingham and Monroe (9). This combination of tests has been called the "Illinois Examination" and has been developed to meet the growing demand for tests which pertain both to intelligence and to abilities in the various school subjects.

New group tests have been reported by Pressey (66) and (68) and by the National Research Council (58). The last test is a modification of the army tests. It is known that the work upon this test has been carried out in the most careful and detailed manner. The test meets a very decided need and will evidently find wide use.

School Subjects

Arithmetic.—The effect of special drill in this subject has been studied by Evans and Knoche (23); and different methods of teaching the process of substraction has been made the subject of an investigation by Winch (97). In addition to these articles Wertheimer (94) has given some results obtained by means of Monroe's tests, and Courtis and Thorndike (14) have discussed correction formulæ for addition tests. This last article offers an important contribution to the technique of testing in this field. Finally, methods of testing in common fractions have been reported upon by Kallom (41).

Algebra.—Kelley (44) has studied in a careful and detailed way the values of algebra. Data upon this problem were procured by means of a questionnaire. The results were given a very careful analysis and evaluation by statistical methods. The article deserves the attention of all teachers of this subject. A series of tests for first year students in this subject have been devised by Dalman (18).

Drawing.—The use of objective criteria for measuring ability in this subject has been carefully discussed by Cohan (10). This is an interesting article written from the standpoint of the drawing teacher rather than from that of the psychologist. He points out some of the limitations of methods used in measurements but has much to say with regard to their value.

English.—A bulletin by Van Wagenen (91) has to do with improvement in the ability to write English compositions.

Grammar.—Tests in this subject have been devised by Kirby (45) and by Charters (9).

Handwriting.—A new scale for measuring handwriting has been proposed by Gilchrist (28), and a unit plan of practice in this subject has been developed by Walker (92).

History.—A very careful evaluation and criticism of all existing tests in this subject has been given in an article by Rugg (77). An index for determining efficiency in history has been proposed by Buckingham (6). This index is based upon the correlation which exists between ability to answer facts in history, and the ability to think in historical terms. The method proposes a new approach to the problem of testing the higher mental activities. It merits the critical attention of all those interested in measurements.

Music.—Two short selections of music written by children have been studied by Platt (62).

Latin.—A test in Latin has been devised by Starch (82), and correlations between translation of Latin and ethical discrimination have been investigated by Cummins (17).

Reading.—Reading ability in its relation to ability in mental tests has been studied by Webb (93) and the content of school reading books has been investigated by Hosic (34), and Woody (103). The results of oral and silent reading tests in the Evanston schools have been discussed by Jones and Lockhart (39). An interesting article by Pressey and Pressey (70) attempts to bring out some of the relations which exist between various elements in reading ability. Their methods involve partial correlation and the results seem to indicate that rate and comprehension are only different phases of the same ability. Improving methods for teaching reading serves as the basis for a discussion by Brown (5) and Theisen (86). An article which looks toward the improvement of reading tests is by Kallom (42). This author compares the question method and the reproduction method of testing comprehension. He reaches the conclusion that the question method is the better. Finally, Gray (29) shows the value of informal tests in this subject.

Spelling.—Murray (56) has reported upon spelling ability of college students, and Richards (75) discusses individual methods as they apply in this subject. An extension of the Ayres' spelling Scale has been developed by Buckingham (7). This increases the number of words in the scale and thus makes it more serviceable for teaching purposes. Scientific methods have been used by Woody (102) in evaluating subject matter for spellers.

Other Educational Problems

Attitude of Students toward Life Work.—The change which takes place with respect to life work between high school and college has been studied by Crathone (15).

Bright Children.—Witmer (99) and Cummins (16) have given suggestions upon dealing with children of this type. These articles together with the book mentioned earlier show an increasing interest in this important phase of educational psychology.

Clinical Methods.—The relation of such methods to educational procedure has been discussed by Freeman (25). His suggestions are illustrated by the careful study of a child who had great difficulty in learning to read. Other contributions upon the same general problems have been made by Poole (63) and (64).

Education Courses.—The relation of psychology to such courses has been studied by Woody (101).

Emotions.—The development of the emotion of admiration in children has been reported upon by Moore (54).

Evaluating Test Material.—An interesting contribution upon this problem has been made by Greene (30). This is a type of work which looks toward the further refinement of testing methods.

Examinations.—A new kind of examination which is patterned after certain psychological tests has been used by McCall (52).

Grading.—A comparison of the ranking of pupils by teachers and principals has been made by Powers (65) and age-grade distributions have been studied by Witham (98).

Improvement in School Subjects.—The improvement of school children in school subjects through the period of a school year has been investigated by Henmon (31).

Interest.—The relation between interest and abilities of college students has been studied by Bridges and Dollinger (3).

Methods for Evaluating the Character of High School Students.—Scales which deal with this general problem have been published by Rugg (79) and by Reeder (74). A method for rating intelligence and will-temperament has been prepared by Downey (22). Another article which has to do with the same general topic is by Freeman (26). The title of his article is "Types of High School Students." There is here an attempt to apply the methods of measurement to a new type of problem in education.

Methods of Instruction.—This problem as it relates to the presentation of material to undergraduates in college has been studied by Holton (33), and the use of educational tests as a means of evaluating instruction has been reported upon by Johnson (36). The relation of tests to certain elements in instruction has been investigated by Monroe (53) and Willing (95).

Rating of Teachers.—This problem has been studied by Dolch

(21)). His method consisted in having pupils render judgment with respect to their teachers. A new method for meeting this problem has been prepared by Conner (12).

Retardation.—This problem as it applies to small country schools has been studied by Kelly and Loomis (43).

Scientific Thinking.—A scale for measuring this type of ability as exhibited in high school students has been proposed by Herring (32).

Study.—Tests of the study methods of Junior High School pupils have been given by Finch (24), and Garth (27) has reported upon the methods used by college students in the preparation of their lessons. An article by Thorndike (87) deals with the relation of environment to study. Other articles which deal with other phases of the problem of study are by Rugg (78), Cooper (13), and Hughes (35).

Transfer.—"The Bode Theory of Transfer as Applied to the Teaching of Mathematics" is the title of an article by Lytle (48).

Use of Tests in Small Schools.—This problem has been discussed by Koos (46) and by Brooks (4).

References

1. Anderson, J. R. Intelligence Tests of Yale Freshmen. *Sch. & Soc.*, 1920, 11, 417–420.
2. Authur, G. An application of Intelligence Tests to the Problem of School Retardation. *Sch. & Soc.*, 1919, 10, 614–620.
3. Bridges, J. W. & Dallinger, V. M. The Correlation between Interests and Abilities in College Courses. *Psychol. Rev.*, 1920, 28, 308–314.
4. Brooks, S. S. Practical Use of Standardized Tests in Rural Schools. *J. of Educ. Res.*, 1920, 1, 392–397.
5. Brown, H. A. Formulation of Method in Reading. *J. of Educ. Res.*, 1920, 2, 436–451.
6. Buckingham, B. R. A Proposed Index of Efficiency in Teaching United States History. *J. of Educ. Res.*, 1920, 1, 161–171.
7. Buckingham, B. R. *Extension of the Ayres Spelling Scale.* Urbana, Ill.: *Bur. Educ. Res.*, Univ. of Illinois, 1919. Pp. 25.
8. Buckingham, B. R. & Monroe, W. S. A Testing Program for Elementary Schools. *J. of Educ. Res.*, 1920, 2, 521–532.
9. Charters, W. W. Constructing a Language and Grammar Scale. *J. of Educ. Res.*, 1920, 1, 249–257.
10. Cohen, J. The Use of Objective Criteria in the Measure of Drawing Ability. *Ped. Sem.*, 1920, 28, 137–151.
11. Colvin, S. S. The Purposes and Methods of Psychological Tests in Schools and Colleges. *Educ.*, 1920, 11, 404–416.
12. Conner, W. L. A New Method of Rating Teachers. *J. of Educ. Res.*, 1920, 1, 338–358.

13. Cooper, S. G. Teaching Students How to Study. *Educ. Rev.*, 1919, **57**, 388–398.
14. Courtis, S. A. & Thorndike, E. L. Correction Formulæ for Addition Tests. *Teacher's Coll. Rec.*, 1920, **21**, 1–24.
15. Crathrone, A. R. Change of Mind Between High School and College as to Life Work. *Educ. Admin, & Sup.*, 2920, **6**, 274–284.
16. Cummins, R. A. 'Bright' and 'Slow' Pupils in Elementary and High School. *J. of Educ. Psychol.*, 1919, **10**, 377–388.
17. Cummins, R. A. Correlation between Translation of Latin Prose and Ethical Discrimination. *J. of Educ. Psychol.*, 1919, **10**, 349–350.
18. Dalman, M. A. Hurdles, A Series of Calibrated Objective Tests in First Year Algebra. *J. of Educ. Res.*, 1920, **1**, 47–62.
19. Dickson, V. E. What First Grade Can Do in School as Related to What is Shown by Mental Tests. *J. of Educ. Res.*, 1920, **2**, 475–480.
20. Dodge, R. The Educational Significance of the Army Intelligence Tests. *Educ.*, 1920, **40**, 417–428.
21. Dolch, E. W., Jr. Pupils' Judgments of their Teachers. *Ped. Sem.*, 1920, **27**, 195–199.
22. Downey, J. E. Rating for Intelligence and for Will-Temperament. *Sch. & Soc.*, 1920, **12**, 292–294.
23. Evans, J. E. & Knoche, F. E. The Effect of Special Drill in Arithmetic as Measured by the Woody and the Courtis Arithmetic Tests. *J. of Educ. Psychol.*, 1919, **10**, 263–276.
24. Finch, C. E. Junior High School Study Tests. *Sch. Rev.*, 1920, **28**, 220–226.
25. Freeman, F. N. Clinical Study as a Method in Experimental Education. *J. of App. Psychol.*, 1920, **4**, 126–142.
26. Freeman, F. N. Types of High School Students. *Sch. Rev.*, 1920, **28**, 383–387.
27. Garth, T. R. How College Students Prepare their Lessons. *Ped. Sem.*, 1920, **27**, 90–98.
28. Gilchrist, E. P. A Handwriting Scale. *Sch. & Soc.*, 1920, **12**, 203–204.
29. Gray, W. S. Value of Informal Tests of Reading Accomplishment. *J. of Educ. Res.*, 1920,**1**, 103–111.
30. Greene, H. A. A Comparison of Two Methods of Evaluating Test Material. *Sch. & Soc.*, 1920, **11**, 777–780.
31. Henmon, V. A. C. Improvement in School Subjects throughout the School Year. *J. of Educ. Res.*, 1920, **1**, 81–95.
32. Herring, J. P. Derivation of a Scale to Measure Abilities in Scientific Thinking. *J. of Educ. Psychol.*, 1919, **10**, 417–431.
33. Holton, E. L. A Study of Methods of Presenting Subjecting Subject-Matter to Undergraduates in College. *Sch. & Soc.*, 1920, **11**, 58–59.
34. Hosic, J. F. The Contents of School Reading Books. *Sch. & Soc.*, 1920, **11**, 179–180.
35. Hughes, W. H. Standardizing Procedure in a Combination System of Supervised Study, Varying Scope of Work, and Weighted Credit. *J. of Educ. Res.*, 1920, **2**, 547–556.
36. Johnson, B. The Use of Tests in the Evaluation of Methods of Instruction. *J. of Educ. Psychol.*, 1920, **11**, 78–88.
37. Jones, A. L. The Place of Psychological Tests in the Admission of Students to College. *Educ.*, 1920, **40**, 429–431.
38. Jones, E. S. The Army Tests and Oberlin College Freshmen. *Sch. & Soc.*, 1920, **11**, 389–390.

39. Jones, E. E. & Lockhart, A. V. A Study of Oral and Silent Reading in the Elementary Schools of Evanston. *Sch. & Soc.*, 1919, **10**, 587–590.
40. Jordon, A. M. Some Results and Correlations of Army Alpha Tests. *Sch. & Soc.*, 1920, **11**, 354–358.
41. Kallom, A. W. Analysis of and Testing in Common Fractions. *J. of Educ. Res.*, 1920, **1**, 177–192.
42. Kallom, A. W. Reproduction as a Measure of Reading Ability. *J. of Educ. Res.*, 1920, **1**, 359–368.
43. Kelly, F. J. & Loomis, A. K. Retardation in One-Room Rural Schools in Kansas. *J. of Educ. Res.*, 1920, **1**, 271–284.
44. Kelley, T. L. Values in High School Algebra and Their Measurement. *Teachers' Coll. Rec.*, 1920, **21**, 246–290.
45. Kirby, T. J. A grammar Test. *Sch. & Soc.*, 1920, **11**, 714–719.
46. Koos, F. H. Educational Measurements in a Small School System. *J. of Educ. Res.*, 1920, **2**, 493–501.
47. La Rue, D. W. *Psychology for Teachers.* New York: American Book Co., 1920. Pp. 288.
48. Lytle, E. B. The Bode Theory of Transfer Applied to the Teaching of Mathematics. *Sch. & Soc.*, 1920, **11**, 457–461.
49. Madsen, I. N. High-School Students' Intelligence Ratings According to the Army Alpha Test. *Sch. & Soc.*, 1920, **11**, 298–300.
50. Madsen, I. N. The Army Intelligence Test as a Means of Prognosis in High School. *Sch. & Soc.*, 1920, **11**, 625–629.
51. Manuel, H. T. *Talent in Drawing.* (School & Home Educ. Monog. No. 3.) Bloomington, Ill. Pub. Sch. Pub. Co., 1919. Pp. 152.
52. McCall, W. A. A New Kind of School Examination. *J. of Educ. Res.*, 1920, **1**, 33–46.
53. Monroe, W. S. Improvement of Instruction through the Use of Educational Tests. *J. of Educ. Res.*, 1920, **1**, 96–102.
54. Moore, R. C. The Emotion of Admiration and its Development in Children. *J. of Exper. Psychol.*, 1920, **5**, 221–235.
55. Murdoch, K. *The Measurement of Certain Elements of Hand Sewing.* (Columbia Univ. Contrib. to Educ. No. 103). New York Columbia Univ., 1919. Pp. 120.
56. Murray, E. The Spelling Ability of College Students. *J. of Educ. Psychol.*, 1919, **10**, 357–376.
57. Myers, G. E. Economy in Intelligence Classification. *Educ. Admin. & Sup.*, 1920, **6**, 309–312.
58. *National Intelligence Tests.* Yonkers-on-Hudson, New York World Book Co., 1920.
59. *National Society for the Study of Education. Nineteenth Year Book, Part II.* Bloomington, Ill. Pub. Sch. Pub. Co., 1920. Pp. 125.
60. Noble, E. L. & Arps, G. F. University Students' Intelligence Ratings According to the Army Alpha Test. *Sch. & Soc.*, 1920, **11**, 233–237.
61. O'Brien, F. P. *The High School Failures.* (Columbia Contrib. to Educ. No. 102). New York Columbia University, 1919. Pp. vii + 97.
62. Platt, W. Two Examples of Child Music. *Brit. J. of Psychol.*, 1920, **10**, 310–311.
63. Poole, G. E. An Analysis of the Proficiency and Competency of a Fourth Grade Class. *Psychol. Clinic*, 1919, **13**, 51–58.

64. Poole, G. E. The Attempt to Teach. A Diagnostic Method Illustrated by the Clinic Teaching of Typical Cases. *Psychol. Clinic*, 1920, **13**, 173–189.
65. Power, L. The Principal and Teachers' Methods of Ranking Pupils. *Elem. Sch. J.*, 1919, **20**, 285–291.
66. Pressey, S. L. A Brief Group Scale of Intelligence for Use in School Surveys. *J. of Educ. Psychol.*, 1920, **11**, 89–100.
67. Pressey, S. L. The "Efficiency" of a Group Scale of Intelligence in Prognosticating Success and Failure in Junior High School. *J. of Appl. Psychol.*, 1919, **3**, 381–385.
68. Pressey, L. W. A Group Scale of Intelligence for Use in the First Three Grades. *J. of Educ. Res.*, 1920, **1**, 285–294.
69. Pressey, L. W. Scale of Attainment No. An Examination of Achievement in the Second Grade. *J. of Educ. Res.*, 1920, **2**, 572–581.
70. Pressey, S. L. & Pressey, L. W. Measures of Reading Ability. *Sch. & Soc.*, 1920, **11**, 747–749.
71. Proctor, W. M. Psychological Tests in Educational Guidance. *J. of Educ. Res.*, 1920, **1**, 369–381.
72. Proctor, W. M. The Use of Psycholgoical Tests in the Vocational Guidance at High School Pupils. *J. of Educ. Res.*, 1920, **2**, 533–546.
73. Proctor, W. M. Psychological Tests and the Probable School Success of High School Pupils. *J. of Educ. Res.*, 1920, **1**, 258–270.
74. Reeder, J. C. The Genesio Scale of Qualities. *Elem. Sch., J.*, 1919, **20**, 292–296.
75. Richards, A. A. Spelling and the Individual System. *Sch. & Soc.*, 1919, **10**, 647–650.
76. Roberts, G. L. & Brandenburg, G. C. The Army Intelligence Tests at Purdue University. *Sch. & Soc.*, 1919, **10**, 776–778.
77. Rugg, E. U. Character and Value of Standardized Tests in History. *The Hist. Outlook*, 1920, **11**, 231–236.
78. Rugg, E. U. Supervised Study in History. *The Hist. Outlook*, 1920, **11**, 142–149.
79. Rugg, H. O. Rating Scales for Pupils' Dynamic Qualities. Standardizing Methods of Judging Human Character. *Sch. Rev.*, 1920, **28**, 337–349.
80. Seashore, C. E. *The Psychology of Musical Talent.* Chicago. Silver, Burdett and Co., 1919. Pp. 288.
80. Seashore, C. E. *A Survey of Musical Talent in the Public Schools.* (University of Iowa Studies in Child Welfare). Iowa City: University of Iowa, 1920, **1**, No. 2. Pp. 36.
81. *Sixth Conference on Educational Measurements.* (Bull. of the Extension Div. Indiana University, 5. No. 1), Bloomington, Indiana Extension Div., Indiana Univ., 1919. Pp. 35.
82. Starch, D. A Test in Latin. *J. of Educ. Psychol.*, 1919, **10**. Pp. 489–500.
83. Strong, E. J., Jr. *Introductory Psychology for Teachers.* Baltimore, Warwick & York, 1920. Pp. xii + 233.
84. Sylvester, R. H. An Intelligence Survey of a Typical Town School. *Ped. Sem.*, 1919, **26**, 463–371.
85. Terman, L. M. The Use of Intelligence Tests in the Grading of School Children. *J. of Educ. Res.*, 1920, **1**, 20–32.
86. Theisen, W. W. Provision for Individual Differences in Teaching Reading. *J. of Educ. Res.*, 1920, **2**, 560–571.
87. Thorndike, E. Environment as a Factor in Pupils' Study Life. *Educ.*, 1920, **40**, 470–483.

88. THORNDIKE, E. L. Intelligence Examinations for College Entranst. *J. of Educ. Res.*, 1920, 1, 329–337.
89. THORNDIKE, E. L. The New Psychological Tests. Are they a Subsitutute for Content Examinations? *Educ. Rev.*, 1920, 59, 97–104.
90. TOOPS, H. A. & PINTNER, R. Mentality and School Progress. *J. of Educ. Psychol.*, 1919, 10, 253–262.
91. VAN WAGENEN, M. J. An Investigation into the Amount of Improvement in Ability to Write English Composition. Minneapolis. *Bulletin of Univ. of Minnesota*, 1919, 22. Pp. 18.
92. WALKER, H. C. The Development of the Unit Plan of Penmanship Practice. *J. of Educ. Res.*, 1920, 1, 112–118.
93. WEBB, L. W. Ability in Mental Tests in Relation to Reading Ability. *Sch. & Soc.*, 1920, 11, 567–570.
94. WERTHEIMER, J. E. Some Results from Monroe's Diagnostic Tests in Arithmetic. *J. of Educ. Psychol.*, 1920, 11, 109–112.
95. WILLING, M. H. The Encouragement of Individual Instruction by Means of Standardized Tests. *J. of Educ. Res.*, 1920, 1, 193–198.
96. WILSON, G. M. *Survey of the Social and Business Usage of Arithmetic.* (Columbia Contrib. to Educ. No. 100). New York. Columbia University, 1919. Pp. v + 62.
97. WINCH, W. H. "Equal Additions" versus "Decomposition" in Teaching Substraction. *J. of Exper. Psychol.*, 1920, 5. Pp. 207–220.
98. WITHAM, E. C. Age-grade distribution. Its principles and application. *J. of Educ. Psychol.*, 1919, 10, 433–444.
99. WITMER, L. The Training of Very Bright Children. *Psychol. Clinic*, 1919, 13, 88–96.
100. WOODROW, H. *Brightness and Dullness in Children.* Chicago. J. B. Lippincott Co., 1919. Pp. 322.
101. WOODY, C. The Administration of the Psychology Prerequisite to Courses in Education. *J. of Educ. Psychol.*, 1920, 11, 61–77.
102. WOODY, C. Application of Scientific Method in Evaluating the Subject Matter of Spellers. *J. of Educ. Res.*, 1920, 1, 119–128.
103. WOODY, C. Overlapping in the Content of Fifteen Second Readers. *J. of Educ. Res.*, 1920, 2, 465–474.

CORRELATION

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One object of these annual summaries on correlation, when they began in 1912, was to encourage the more frequent use of this important statistical tool. The deluge of studies using correlation in recent years makes it clear to the writer that this need has been met. The mere indexing of analagous studies does not justify the time required. The writer expects hereafter to cite papers that indicate extensions in new fields, and those in which contrasting points of view are involved. The main emphasis will be on the interpretation of coefficients and improvement in the statistical methods involved.

Interpretation of Coefficients.—Several papers inquire into the fundamental psychological assumptions on which measurements rest. The doubtful psychological equivalence of the units of measurement in tests and the clearer meaning of ranks in behavior, raises the question whether ranks might not be psychologically more sound and practically more fruitful even if they are biologically less broadly significant. Units of rank orders, Boring (**9**) concludes, are validly demonstrable for abilities. They afford the possibility of statistical treatment in terms of medians, quartiles, contingencies and correlation ratios, while we are not justified in assuming that the usual mental test scales are made up of equivalent units which can be treated with the statistics of averages, standard deviations, coefficients of correlation and linear regressions. See also McEwen and Michael (**22**) and the Scott Laboratory (**32**). Ruml (**28**) thinks that the failures of mental tests may in part be traced to "a willingness to accept statistical hypotheses as applied to intelligence simply to have statistical technique available for use." In particular he criticizes the assumptions: (1) That general intelligence can be expressed as a one-dimensional function. It is analogous to "size." (2) That regression of general intelligence upon test performances is linear. Evidences that it is linear which are based upon judged intelligence is "ordinarily worthless." Gross departures from linearity are found in age and in trade test relations.

(3) That an individual maintains a static level of intelligence from time to time. Correction for attenuation is made on this assumption, viz., that the difference between performances with the same test are due to errors in measuring rather than to actual variation of the ability from time to time. Mitchell (**23**) gives evidence that memory span is not static for the same individual. Myers (**25**) cautions against concluding that a close correlation between group and individual tests for school groups including several grades and wide ranges of mental ages would hold for a homogeneous group in any single school grade. Thorndike (**38**) indicates that a "halo" of general merit affects estimates of special traits so as to make their intercorrelations too large.

Thompson's paper (**33**) may upset the common explanation of the size of coefficients. It shows the possible effects of what he defines as "interference factors." These are groups of elements which operate in favor of one test and against another, a condition which is psychologically likely. If interference factors exist, zero correlation does not show that either general or group factors are not common to the two variates measured; high common factors may exist with low correlations; transfer of training is possible with no improvement of the second variate after the training and a reduction of the coefficient; after training the coefficient may remain the same in spite of the common factors having been much improved; the contemporary training of two abilities with common factors does not necessarily alter their correlation. Experiments might be arranged to discriminate some of these different effects. His method is an extension of Weldon's and of Thomson's dice patterns in which the factors producing correlation are additive. It gives splendid possibilities of visualizing possible sources of effects on the correlation coefficients and may be utilized by a non-mathematical experimenter who wishes to test whether his generalizations are justified. Other interpretations of correlations than those that assume the overlapping of common factors which are additive are to be taken up later. For example, the correlation may result from exclusion due to drawing from a limited pool, as in whist hands. Combination of elements by multiplying, instead of adding, would not affect the results provided that the form of function according to which the elements combine is the same in each variate, and the standard deviation of each element is the same.

Group Factors versus a General Factor.—A number of important papers treat of the relation of mental abilities to general, group,

and specific factors. It is quite impossible in this summary to state the numerous qualifying clauses in these papers, but the drift of the discussion leaves the problem as follows: (1) A perfect hierarchy would demonstrate, as Spearman claims, that there is a *single* general factor and no group factors except for quite similar activities and these of small effect. (2) An imperfect hierarchy would be explained by group factors with or without general factors. (3) Interference elements included in general factors would account for any set of correlation coefficients, Thompson (33). (4) It is not certain whether the empirical data form a perfect hierarchy or only approach it. In this situation there is a general tendency to accept important group factors, types or levels, with possible universal factors. In the discussion Spearman defends his theory of the Two Factors, General and Specific, and believes his contention is proved. Thomson regards General Factors as unproved and unnecessary, although possible, and believes that the overlapping of important group factors best explains the available data. Garnett prefers Spearman's theory.

The mathematical foundation on which Spearman erected his valiant hypothesis on the General Common Factor has been seriously shaken by Thomson (35, 36, 37). He shows that the criterion for determining the degree of perfection in a hierarchy of coefficients is mathematically incorrect and exaggerates the approach to perfection. In an artificial example, the known true degree of perfection, .59, was calculated by the Spearman criterion to be 1.00. Two sources of error in Spearman's proof of his criterion are demonstrated: (1) The arbitrary plan by which he rejects coefficients from a table happens to leave those which bring the average to about 1.00; (2) the equation for degree of perfection of the hierarchy assumes certain quantities uncorrelated when they are really strongly correlated and cannot be neglected. The use of Spearman's criterion mars Webb's and Garnett's deductions as to "general ability" and "will" factors. Thomson (35) also shows how overlapping group factors may be harmonized with a small transfer of training which otherwise tends to support the hypothesis of the absence of group factors. If improvement were due to the selection, mainly the economy, of elemental factors used in any activity, this might occur without the improvement of the elements themselves and so transfer only slightly to other group combinations of the elements. Similarly one might conceive a football team to gain by playing together, by its team work, by its elimination of

useless factors, without the players becoming better individual players and without the improvement transferring to other teams in which the men play. In restating his hypothesis, under which "any performance is considered as being carried out by a sample of group factors," Thomson names it the Sampling Theory of Ability. A hierarchical order of coefficients is the natural order to expect on the theory alone of chance sampling of abilities. On the Mendelian theory any individual is a sample of unit qualities, so each of his activities may involve a further sampling of these qualities. A general factor, if found in Smith, may not be the same as a general factor found in Jones. He gives an admirable review in non-mathematical language of the entire discussion of the General Factor.

Regarding his theory of Two Factors, which was forecast in 1904, Spearman (31) says: "Hardly any writer (outside of those working in more or less intimate connection with myself) has so far uttered a sign of being convinced." He thinks that this obduracy may be due to a question in the minds of investigators who admit that his theory requires the data to conform to his equation and yet believe that other theories would also meet the same criterion. Now that Garnett (14, 15, 16) and Spearman (31) show that a perfect hierarchy requires a single general factor, Spearman hopes for a more general acceptance of his Theory. He also elaborates an earlier note regarding the method of showing by dice patterns that hierarchies could be produced from group factors. The dice hierarchy introduces the General Factor under another form. As shown also by Garnett and admitted by Thomson (16) the perfect hierarchy may mean either a single General Factor or group factors which are made up of an infinite number of interchangeable elements of the General Factor, which would still be interpretable as an underlying fund of brain energy. In discussing the group-factor hypothesis for explaining perfect hierarchies Garnett (15) is only concerned with variables that are distributed according to the normal law and measured in such units as will give each the same standard deviation. The correlations between three variables will always satisfy the conditions for a hierarchy expressed by terms of four independent variables of which one is a general factor while each of the others is a specific factor. There can always be found an infinite number of general factors of correlated variables. These general factors are to be distinguished from the unique general factor whose correlations satisfy the conditions for a perfect hier-

archy. Garnett (13) finds that the data from Webb's monograph on Character and Intelligence indicate that several intellectual qualities (humor, originality and quickness) may be regarded as compounded of General Ability, and of an independent group factor "Cleverness." The latter, following Mercier, seems to be innate while General Ability may be acquired. A number of character traits (tendency not to abandon tasks in the face of obstacles or from mere changeability, kindness on principle, trustworthiness, conscientiousness, working with distant objects in view) show not only General Ability but "Purpose" which is a factor compounded of General Ability and an independent Group factor. He gives an equation for testing these relations and shows how the relations of General Ability and a group factor may be represented in three dimensions.

Other Contrasting Interpretations.—Pearson (26) finds that the resemblance of sibling orphans, published by Kate Gordon, .508, is very close to that found by the Galton Laboratory, .515, for siblings in general. It is new evidence that the sameness in environment of the non-orphan sibling pairs could hardly be the cause of their resemblance. Bagg (6) utilizes correlation, probably for the first time, in connection with the study of habit formation and family resemblance in animal behavior. No family resemblance appears in the behavior of mice, as judged by the non-reduction of the mean variations within the litters as compared with random groups of the same size. There is a correlation between early and late performances of the same mice. Rosenow (29) and Murchuson (24) discuss the relation of delinquency to intellectual deficiency. The former concludes, that, if the coefficient of correlation between intelligence and delinquency is +0.66 as Goring found in The English Convict, "the correct conclusion to be drawn is that it is exceedingly probable that factors other than intelligence are of *greater* importance as determinants of crime than intelligence." To the reviewer it does not seem that his demonstrations that all other causes combined correlate over .66 with delinquency, that there is a *possibility* of a score of larger causes and that these when combined with deficiency produce only a small addition to the total correlation with delinquency, do not raise the *probability* that there is one larger cause. Murchuson tested 3,328 criminals who could read and write and found a median intelligence score with the army tests of 62, which compares with that for the army and concludes "the difference between the average

individual and the average criminal is not a difference which can be expressed in terms of intelligence." This conclusion is not clear from the data published. His exclusion of illiterates may have affected the comparison. Moreover the criminals should be compared with the intelligence average of their states not with the army generally.

The Statistical Methods of Correlation.—A more general method than multiple correlation or than least squares has been provided by McEwen and Michael (**22**) for determining the functional relation of one variable to each of a number of correlated variables. The method has been found to be practically more useful in making predictions when the forms of the functions are unknown, as is frequently the case in dealing with biological material, especially social material. It avoids the assumption of practical linearity made in multiple correlation or that of any pre-determined mathematical function as in the method of least squares. The method consists of determining the relation of the independent variable to each of the dependent variables by a successive approximation to group averages. The coefficient is comparatively easily calculated by following their model. An illustrative case is worked out in the prediction of wheat yield per acre in South Dakota on the basis of the season's temperature and precipitation. The writers were collaborating on problems concerning the quantitative relation between variations in the number of certain marine organisms and fluctuations in the elements of their environment. The paper is introduced by Wm. E. Ritter as an important step forward in the methodology of natural science. Smith (**30**) develops the method for proper choice of distributions of observations for two variates connected by a linear relation. Isserlis' paper (**18**) is described by its title. Kornhauser, Meine and Ruml (**21**) explain the construction of two three-dimension models which materially assist in visualizing and understanding the meaning and relations of the coefficients of correlation and regression, the standard error of the variates, and the standard error of estimation.

Short Methods.—The Scott Company Laboratory (**32**) gives tables for facilitating the calculation of correlation by the rank difference method. They include the squares of differences up to a difference of 80, and the corresponding coefficients. Burtt (**8**) shows how to calculate partial correlations with a slide rule and finds it as rapid and accurate as using tables. Chapman (**11**) supplements Thurstone's method of calculating the product-

moment coefficient without the use of deviations by also avoiding cross multiplying of the two variates. The necessary operations can then be performed by tables of squares and an adding machine. A splendid series of papers by Ayres shows short and easy ways of computing the product-moment coefficient (4, 1, 5), the coefficient of regression (2) and the correlation ratio (3). His simple method for computing the product-moment coefficient (4) saves from half to three fourths of the time of the common method. The method is based in the principle that in any series of numbers the sum of the squares of the deviations from the average is equal to the sum of the squares of the numbers in the series, minus the product of the total of the series and its average.

New Applications.—Thomson (34) shows that the problem of right and wrong cases in psycho-physics is a special case of the application of Pearson's Criterion of Goodness of Fit. Kelley (20) shows how partial correlation indicates principles for the selection of tests for classifying men. He also calculates that the army mental tests correlate .484 with vocational choice, and that all factors not measured by the tests would correlate .875. This method of estimating the relation to other factors than those tested is suggestive. It is also followed by Rosenow (29) who gives a table for facilitating the calculation, assuming various intercorrelations of the variables. Toops and Pintner (40) find a rank correlation of the intelligence level of trades with the grades at leaving school amounting to .79. Pressey and Ralston (27) trace the relation of the occupations of fathers to the intelligence of their children. Burtt (7) shows how he utilized regression equations for weighting test scores to place men at the work for which they were best fitted in an auto tire factory. Kelley (19) gives a method for correcting the measure of overlapping in school grades for a tested ability. All other measures have been incorrect, he claims, in not allowing for the reliability coefficients of the tests. Thurstone (39) derives a formula for weighting the right and wrong answers of a test in order to obtain the highest correlation with the criterion chosen. Courtis and Thorndike (12) set forth a method for developing correction formulæ for a test, in this case an addition test, under which the results are tested for various methods of giving and scoring the test. Through the intercorrelations it was found that scoring this test by the rate of performance at 75 per cent. accuracy corrected for motor ability was best. Rate scores are better than accuracy. The relations between

interests and abilities are shown by (10) and (17), between mentality and school progress by (41). Yoakum and Yerkes (42) give the best summary of the application of the army tests to educational and industrial problems.

REFERENCES

1. AYRES, L. P. The Application to Tables of Distribution of a Shorter Method for Computing Coefficients of Correlation. *J. of Educ. Res.*, 1920, 1, 295–325.
2. AYRES, L. P. Coefficients of Regression. *J. of Educ. Res.*, 1920, 1, 398–421.
3. AYRES, L. P. Correlation Ratio. *J. of Educ. Res.*, 1920, 2, 452–457.
4. AYRES, L. P. A Shorter Method for Computing the Coefficient of Correlation. *J. of Educ. Res.*, 1920, 1, 216–239.
5. AYRES, L. P. Substituting Small Numbers for Large Ones in the Computation of Coefficients of Correlation. *J. of Educ. Res.*, 1920, 2, 502–519.
6. BAGG, H. J. Individual Differences and Family Resemblances in Animal Behavior. *Archives of Psychol.*, 1920, **26**, 1–58.
7. BURTT, H. E. Employment Psychology in the Rubber Industry. *J. of Appl. Psychol.*, 1920, 4, 1–18.
8. BURTT, H. E. Partial Correlations on a Slide Rule. *Psychol. Bull.*, 1919, **16**, 240–242.
9. BORING, Edwin G. The Logic of the Normal Law of Error in Mental Measurement. *Amer. J. of Psychol.*, 1920, **31**, 1–33.
10. BRIDGES, J. W. & DOLLINGER, V. M. The Correlation between Interests and Abilities in College Courses. *Psychol. Rev.*, 1920, **27**, 308–315.
11. CHAPMAN, J. C. A Method of Calculating the Pearson Coefficient of Correlation without the Use of Deviations or Cross Multiplying. *Psychol. Bull.*, 1919, **16**, 369–371.
12. COURTIS, S. A. & THORNDIKE, E. L. Correction Formulæ for Addition Tests. *Teachers College Record*, 1920, **21**, 1–24.
13. GARNETT, J. C. M. General Ability, Cleverness and Purpose. *Brit. J. of Psychol.*, 1919, **9**, 345–367.
14. GARNETT, J. C. M. On Certain Independent Factors in Mental Measurements. *Proc. Royal Soc.*, 1919, A, **96**, 91–112.
15. GARNETT, J. C. M. The Single General Factor in Dissimilar Mental Measurements. *Brit. J. of Psychol.*, 1920, **10**, 242–259.
16. GARNETT, J. C. M. & THOMSON, G. H. Joint note on "The Hierarchy of Abilities." *Brit. J. of Psychol.*, 1919, **9**, 367–369.
17. HARTMAN, R. & DASHIELL, J. F. An Experiment to Determine the Relation of Interests to Abilities. *Psychol. Bull.*, 1919, **16**, 259–262.
18. ISSERLIS, I. Formulæ for Determining the Mean Values of Products of Deviations of Mixed Moment Coefficients in Two to Eight Variables in Samples taken from a Limited Population. *Biometrika*, 1918, **12**, 183–184.
19. KELLEY, T. L. The Measurement of Overlapping. *J. of Educ. Psychol.*, 1919, **10**, 458–461.
20. KELLEY, T. L. Principles Underlying the Classification of Men. *J. of Appl. Psychol.*, 3, 50–68.
21. KORNHAUSER, A. W., MEINE, F. & RUML, B. Two Models Showing the Interrelation of Several Significant Correlation Variables. *Psychol. Bull.*, 1919, **16**, 230–235.

22. McEwen, G. F. & Michael, E. L. The Functional Relation of one Variable to Each of a Number of Correlated Variables Determined by a Method of Successive Approximation to Group Averages: A Contribution to Statistical Methods. *Proc. Amer. Acad. of Arts and Sci.*, 1919, **55**, 95–133.
23. Mitchell, D. Variability in Memory Span. *J. of Educ. Psychol.*, 1919, **10**, 445–458.
24. Murchuson, C. Criminals and College Students. *School & Soc.*, 1920, **12**, 24–30.
25. Myers, G. C. A Grave Fallacy in Intelligence Test Correlations. *School & Soc.*, 1920, **11**, 528–529.
26. Pearson, K. Inheritance of Psychical Characters. *Biometrika*, 1919, **12**, 367–376.
27. Pressey, S. L. & Ralston, R. The Relation of the General Intelligence of School Children to the Occupation of Their Fathers. *J. of Appl. Psychol.*, 1919, **3**, 366–374.
28. Ruml, B. The Need for an Examination of Certain Hypotheses in Mental Tests. *J. of Phil., Psychol. & Sci. Meth.*, 1920, **17**, 57–61.
29. Rosenow, C. Is Lack of Intelligence the Chief Cause of Delinquency. *Psychol. Rev.*, 1920, **27**, 147–157.
30. Smith, K. On the Standard Deviations of Adjusted and Interpolated Values of an Observed *Polynomial Function* and its Constants and the Guidance they give towards a Proper Choice of the Distribution of Observations. *Biometrika*, 1918, **12**, 1–85.
31. Spearman, C. Manifold Sub-theories of "The Two Factors." *Psychol. Rev.*, 1920, **27**, 159–173.
32. Scott Company Laboratory. Tables to Facilitate the Computation of Coefficients of Correlation by the Rank Difference Method. *J. of Appl. Psychol.*, 1920, **4**, 115–125.
33. Thompson, J. R. The Role of Interference Factors in Producing Correlation. *Brit. J. of Psychol.*, 1919, **10**, 81–100.
34. Thomson, G. H. The Criterion of Goodness of Fit of Psychophysical Curves. *Biometrika*, 1919, **12**, 216–230.
35. Thomson, G. H. The General Factor Fallacy in Psychology. *Brit. J. of Psychol.*, 1920, **10**, 319–326.
36. Thomson, G. H. General versus Group Factors in Mental Activities. *Psychol. Rev.*, 1920, **27**, 173–191.
37. Thomson, G. H. On the Degree of Perfection of Hierarchical Order Among Correlation Coefficients. *Biometrika*, 1919, **12**, 355–366.
38. Thorndike, E. L. A Constant Error in Psychological Ratings. *J. of Appl. Psychol.*, **4**, 25–30.
39. Thurstone, L. L. A Scoring Method for Mental Tests. *Psychol. Bull.*, 1919, **16**, 235–240.
40. Toops, H. A. & Pinter, R. Educational Differences among Tradesmen. *J. of Appl. Psychol.*, 1919, **3**, 33–50.
41. Toops, H. A. & Pinter, R. Mentality and School Progress. *J. of Educ. Psychol.*, 1919, **10**, 253–263.
42. Yoakum, C. S. & Yerkes, R. M. *Army Mental Tests*. Henry Holt & Co., 1920. Pp. xiii + 303.